

Teacher Guide: Proboscideans

Concepts:

- Living and extinct animals can be classified by their physical traits into families and species.
- We can often infer what animals eat by the size and shape of their teeth.

Learning objectives:

- Students will learn about the relationship between extinct and extant proboscideans.
- Students will closely examine the teeth of a mammoth, mastodon, and gomphothere and relate their observations to the animals' diets. They will also contrast a human's jaw and teeth to a mammoth's. This is an excellent example of the principle of "form fits function" that occurs throughout biology.

TEKS: Grade 5

§ 112.16(b)7D, 9A, 10A

Location: Hall of Geology & Paleontology (1st Floor)

Time: 10 minutes for "Mammoth & Mastodon Teeth," 5 minutes for "Comparing Human & Mammoth Teeth"

Supplies:

- Worksheet
- Pencil
- Clipboard

Vocabulary: *mammoth, mastodon, grazer, browser, tooth cusps, extant/extinct*

Pre-Visit:

- Introduce students to the mammal group Proboscidea, using the Meet the Proboscideans worksheets.
- Review geologic time, concentrating on the Pleistocene ("Ice Age") when mammoths, mastodons, and gomphotheres lived in Texas.
- Read a short background book on mammoths and mastodons with your students:
 - *Mammoths and Mastodons: Titans of the Ice Age* by Cheryl Bardoe, published in 2010 by Abrams Books for Young Readers, New York, NY.

Post-Visit Classroom Activities:

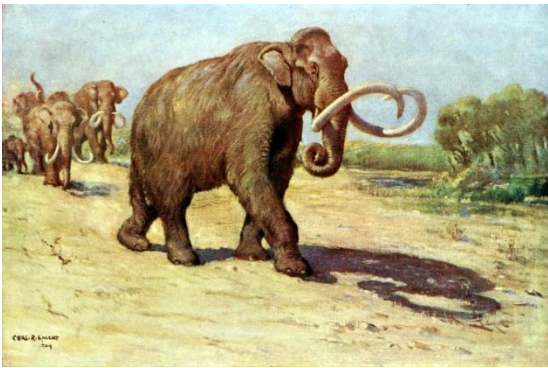
- Assign students a short research project on living proboscideans (African and Asian elephants) and their conservation statuses (use <http://www.iucnredlist.org/>). Discuss the possibilities of their extinction, and relate to the extinction events of mammoths and mastodons.

Meet the Proboscideans

Mammoths, Mastodons, and Gomphotheres are all members of **Proboscidea** (pro-bo-SID-ia), a group which gets its name from the word **proboscis** (the Latin word for nose), referring to their large trunks. They were some of the largest mammals to ever live on the land.

The fact that we have two living members of proboscideans (Asian elephants, African elephants) is extremely helpful in understanding how extinct proboscideans would have lived—what they ate, where they roamed, and how they raised their young. Scientists often compare mammoth and mastodon fossils to elephants living today.

Can you identify four similarities and differences between extinct mammoths (left) and elephants living today (right)? Hint: think about their appearance, diet, habitat, range, and behavior.



Similarities:

- 1.
- 2.
- 3.
- 4.

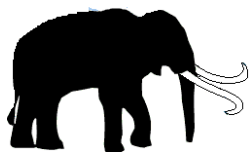
Differences:

- 1.
- 2.
- 3.
- 4.

Meet the Proboscideans, continued

This chart lists the key characteristics of several extinct and living (extant) Proboscideans.

	Columbian Mammoth	Woolly Mammoth	American Mastodon	African Elephant	Asian Elephant
Scientific Name	<i>Mammuthus columbi</i>	<i>Mammuthus primigenius</i>	<i>Mammot americanum</i>	<i>Loxodonta africana</i>	<i>Elephas maximus</i>
Height	Up to 13 ft.	Up to 11 ft.	Up to 10 ft.	Up to 11 ft.	Up to 10 ft.
Weight	10 tons	6 tons	4-5 tons	4-6 tons	3-5 tons
Back Shape	Sloping	Sloping	Straight	Saddle-shaped	Humped
Fur	Sparse	Very thick	Probably thick	Very sparse	Sparse
Head	High single dome	High single dome	Low single dome	Low single dome	Double dome
Ear	Small	Very small	Unknown	Large	Medium
Tusks	Curved & twisted, very large	Curved and twisted	Sometimes two pairs	Gently curved, medium	Gently curved, short
Trunk Tip	Unknown	1 short, 1 long "finger"	Unknown	2 equal "fingers"	1 "finger"
Tail	Long	Short	Medium	Long	Long
Range in North America	US and Mexico	Canada and the northern US	Canada, US, parts of Mexico	None (today found in Africa)	None (today found in Asia)
Extinct or living?	Extinct	Extinct	Extinct	Living, vulnerable	Living, endangered



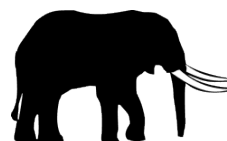
Columbian



Woolly



Mastodon



African

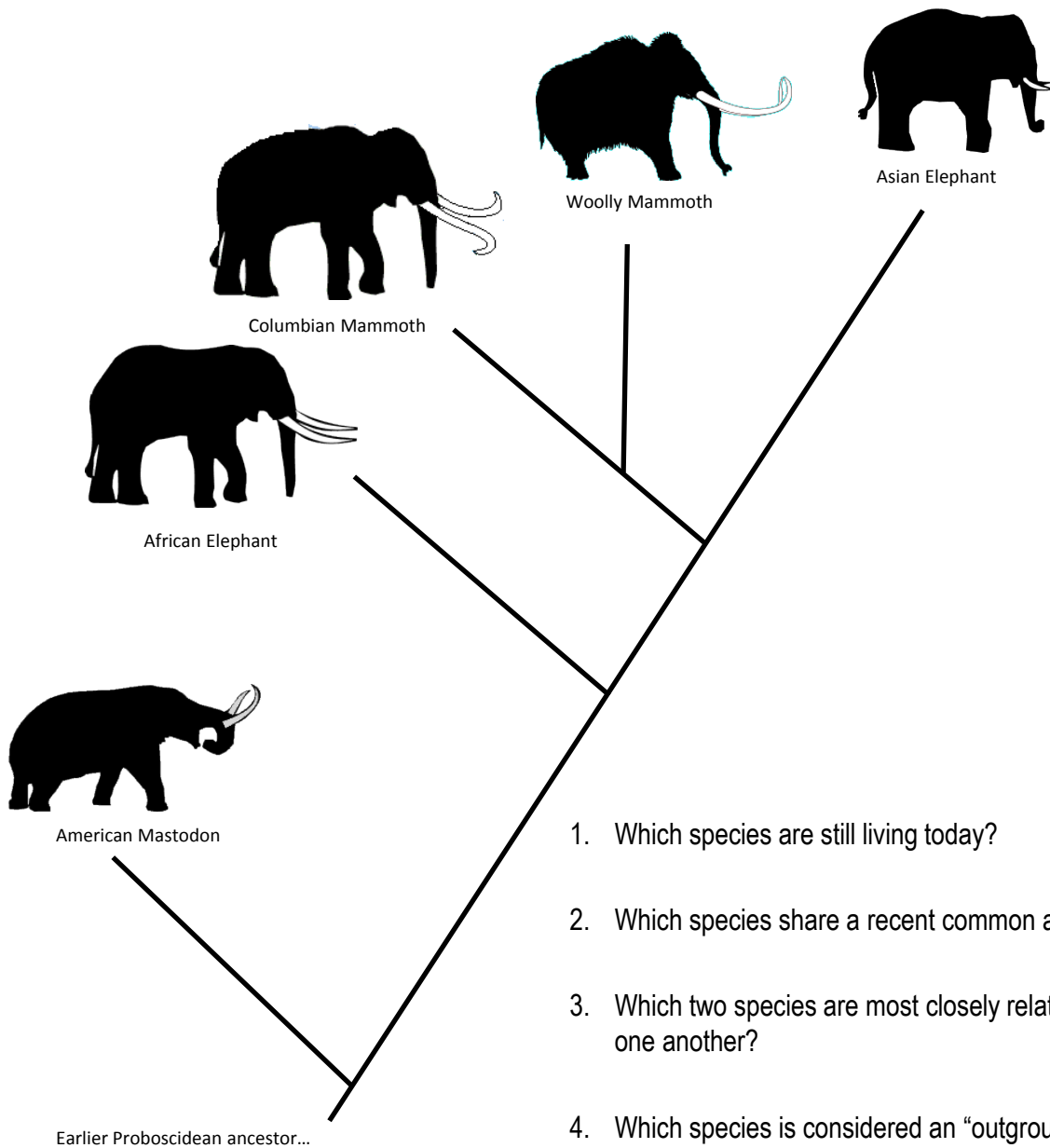


Asian

Chart adapted from *Mammoths: Giants of the Ice Age*, Revised Edition, by Lister and Bahn 2007
 Illustrations from <http://www.himandus.net/elefunteria/library/science+nature/evolution.html>

Meet the Proboscideans, continued

Use the information on the previous page and this evolutionary tree to answer the following questions. Branch points (where one line splits into two) show recent common ancestors. The outgroup is the species least closely related to all the others.



Mammoth & Mastodon Teeth

In the Hall of Geology & Paleontology (1st Floor) you will find teeth from a **Columbian Mammoth** and an **American Mastodon** located in the Ice Ages case in the center of the hall. Draw each of the teeth (**molars**) in the chart below, then answer the questions.

Columbian Mammoth molar	American Mastodon molar

1. **Grazers** are animals that feed on grasses that grow low to the ground (cattle, horses, and sheep are grazers). Teeth that are tall (have high crowns) and have lots of sharp ridges are usually better for grazing because the upper and lower teeth grind together to pulverize tough grasses so that they are edible. Which animal do you think was a grazer?
2. **Browsers** are animals that feed on buds, leaves, twigs, and bark above the ground—sometimes high in trees (deer and giraffes are browsers). Their teeth have shorter crowns and often a few large cusps. Which animal do you think was a browser?
3. Next, find the **Cuvier's Gomphothere** jaw fragment in the same case. Are the teeth more similar to mammoth or mastodon teeth? Do you think a gomphothere was a grazer or a browser?
4. Lastly, find the tusks. What part of the body are they?

Mammoth & Mastodon Teeth

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Mastodon; browser

4. Lastly, find the tusks. What part of the body are they? **Front upper teeth (incisors)**

Comparing Human & Mammoth Teeth

Compare the human and mammoth **mandibles** (lower jaws). The photos are not to scale—a mammoth's jaw is *much* larger than a human's in real life!

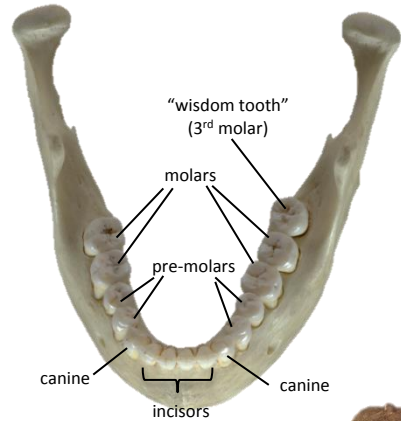
Human

Number of tooth types in the lower jaw: _____

Number of teeth total: _____

(Note: This person is missing a wisdom tooth, so add 1 to the count!)

Describe the size and shape of the teeth:

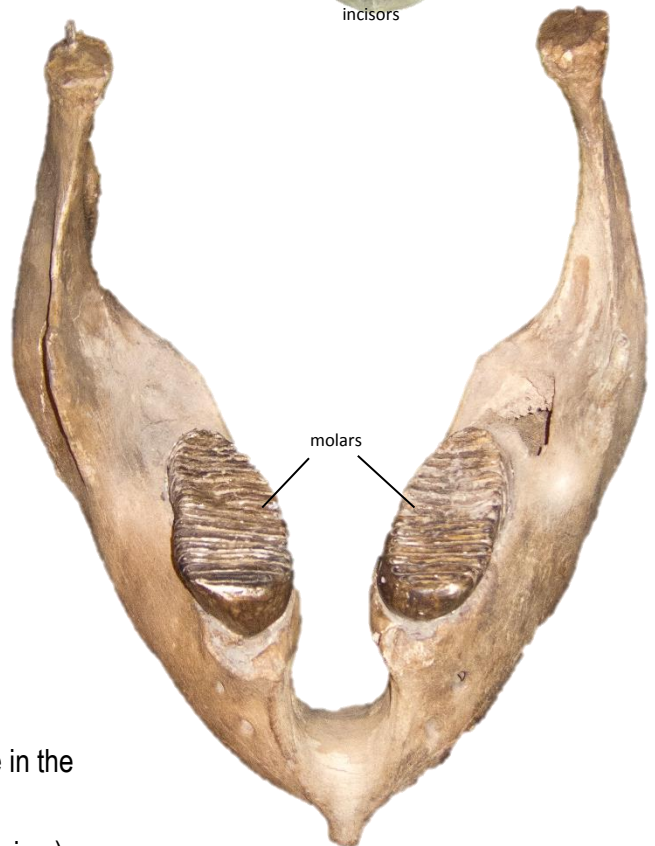


Mammoth

Number of tooth types in the lower jaw: _____

Number of teeth total: _____

Describe the size and shape of the teeth:



Why do you think there is such a big difference in the number of teeth and their size and shape?
(Hint: Think about differences in diet and body size.)